Thesis Portfolio

Automated Macrophage Quantification Program for Tissue-Engineering
(Technical Report)

Gender Bias in the United States Department of Veterans Affairs PTSD Program
(STS Research Paper)

An Undergraduate Thesis

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Bachelor of Science, School of Engineering

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Table of Contents

Sociotechnical Synthesis

My technical and STS projects both address aspects of the socio-technical challenge of developing new biomedical technology to treat individuals suffering from disease or injury. Specifically, they both focus on treatments for medical conditions that are common in war veterans. Individuals in the military suffer extensive traumatic injuries on the battle field, including unrecoverable volumetric muscle loss (VML) injuries, which occur when the degree of tissue loss exceeds the endogenous regenerative capacity of skeletal muscle. There are no current treatment options that effectively restore form and function of muscle tissue after these injuries. To address this problem, new tissue-engineered technology is being developed. Macrophages are a major player with extremely important roles in functional regeneration of muscle; analysis of macrophage phenotype over time provides significant information to aid in understanding the process of macrophage recruitment to injury site. The technical project designed a standardized automated method of quantifying macrophage phenotype in skeletal muscle histology slides, which provided insight as to the role's macrophages play in the wound healing process.

The STS Project explored the PTSD treatment that is available to war veterans through the Veteran's Administration (VA). While it is understood by the VA that the current services provided are adequate for meeting the care needs of veterans with PTSD, studies that indicated female veterans with PTSD or depressive symptoms experience barriers to VA health and unmet medical needs. The project used the large technical system and banality of evil frameworks to explore how the construction of this system led to the gender bias still experienced by female veterans today. Conducting both of these projects together brought my attention to the intersection of technology and society and made me more aware of the social aspects that come into play when designing a technical solution for medical treatment purposes.